

1. Find the exact value of the expression.

(a)  $\arcsin \frac{\sqrt{3}}{2}$

(b)  $\arccos \left( -\frac{1}{2} \right)$

(c)  $\sin^{-1} \left( -\frac{\sqrt{2}}{2} \right)$

(d)  $\tan^{-1} \sqrt{3}$

(e)  $\sin \left( \cos^{-1} \left( -\frac{3}{5} \right) \right)$

(f)  $\sin(\arcsin 3)$

(g)  $\cos^{-1} \left( \cos \frac{4\pi}{3} \right)$

(h)  $\tan^{-1} \left( \tan \frac{5\pi}{4} \right)$

(i)  $\sin^{-1} \left( \sin \frac{11\pi}{6} \right)$

(j)  $\sin \left( 2 \cos^{-1} \frac{1}{3} \right)$

2. Simplify each expression.

(a)  $\tan(\sin^{-1} x)$

(b)  $\cos(\tan^{-1} x)$

3. Find the limit.

(a)  $\lim_{x \rightarrow \infty} \sin^{-1} \left( \frac{x^2 - 1}{2x^2 + 4} \right)$

(b)  $\lim_{x \rightarrow \infty} \tan^{-1} \left( \frac{x^2}{2 - x} \right)$

4. Find the domain of the function  $f(x) = \arccos(3x + 2)$ .

5. Find the derivative.

(a)  $y = \tan^{-1}(2x + 1)$

$$(b) \ y = \sqrt{x} \sin^{-1}(x^3)$$

$$(c) \ y = (\cos^{-1}(4 - 2x))^5$$

6. Find the limit.

$$(a) \ \lim_{x \rightarrow \infty} \frac{(\ln x)^2}{x - 1}$$

$$(b) \ \lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$$

$$(c) \lim_{x \rightarrow 0^+} x^2 \ln x$$

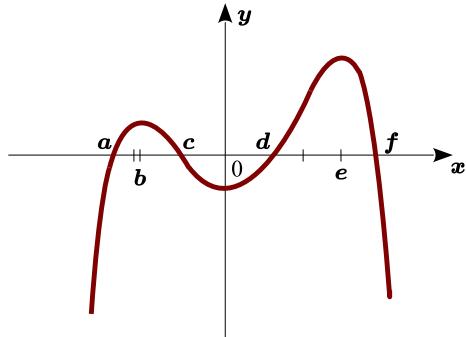
$$(d) \lim_{x \rightarrow \infty} (e^x + x)^{1/x}$$

$$(e) \lim_{x \rightarrow 0} (\sin x)^{\tan x}$$

$$(f) \lim_{x \rightarrow 1} \left( \frac{1}{\ln x} - \frac{1}{x-1} \right)$$

7. The graph of the derivative,  $f'(x)$ , is shown below. Use the graph to answer these questions.

- On what intervals is  $f$  increasing? decreasing?
- On what intervals is  $f$  concave up? concave down?
- At what values of  $x$  does  $f$  have a local maximum or minimum?
- At what values of  $x$  does  $f$  have an inflection point?
- Assuming that  $f$  is continuous and  $f(0) = 0$ , sketch a graph of  $f$ .



8. Find all absolute and local extrema for the following functions by graphing.

(a)  $f(x) = x^2 - 3, -1 \leq x \leq 2.$

(b)  $f(x) = \begin{cases} x^2, & \text{if } -1 \leq x < 0 \\ 2 - x^2, & \text{if } 0 \leq x \leq 1 \end{cases}$

9. Find all critical numbers for the following functions.

(a)  $f(x) = \sqrt[3]{x}(x - 1)^2$

(b)  $f(x) = |x^2 - 5x|$

(c)  $f(x) = xe^{-2x}$

10. Find the absolute maximum and absolute minimum of the given function on the given interval.

(a)  $f(x) = x^3 - 12x + 1, [-3, 5]$

(b)  $f(x) = \frac{\ln x}{x}, [1, 3]$

(c)  $f(t) = 16 \cos t + 8 \sin 2t, \left[0, \frac{\pi}{2}\right]$